IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application. No:	10/669,028
Filed:	September 23, 2003
Inventor(s):	Gregory D. Martin, Eugene Boe, Stephen Piche, James David Keeler, Douglas Timmer, Mark Gerules, John P. Havener and Steven J. McGarel (corrected)
Title:	KILN THERMAL AND COMBUSTION CONTROL

§

Examiner:	Bahta, Kidest
Group/Art Unit:	2125
Atty. Dkt. No:	5650-04211

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on the date indicated below.

Mark S. Williams

Signature — December 22, 2005 Date

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AMENDMENT UNDER 37 CFR 1.312

Mail Stop Issue Fee
Commissioner for Patents
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Alexandria, VA 22313-1450

Dear Sir:

This paper is submitted after allowance and with payment of the issue fee.

Please amend the case as listed below.

CONCLUSION

If any extensions of time (under 37 C.F.R. § 1.136) are necessary to prevent the above referenced application(s) from becoming abandoned, Applicant(s) hereby petition for such extensions. If any fees are due, the Commissioner is authorized to charge said fees to Meyertons, Hood, Kivlin, Kowert & Goetzel PC Deposit Account No. 50-1505/5650-04211/JCH.

Also enclosed herewith are the following items:

☒ Return Receipt Postcard

☒ Form PTOL-85B (in duplicate)

Respectfully submitted,

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IN THE CLAIMS:

The following listing of claims will replace all prior versions, and listings, of claims in the application.

1. (Previously Presented) A controller for controlling a multi-variable input system having a plurality of manipulatible variables (MVs) as inputs, and operable to provide a plurality of measurable outputs and at least one unmeasurable output, which unmeasurable output can not be measured in substantially real time and requires external analysis for the determination of parameters thereof, comprising:

a system predictive model that provides a model of the dynamics of selected aspects of the operation of the system for modeling the dynamics thereof and providing at least one predicted output for at least a select one of the measurable outputs;

an external predictive model for predicting as a predicted control value the dynamic response of a select one of the measurable outputs as a function of the at least one unmeasurable output to achieve a desired value of the at least one unmeasurable output;

an optimizer for receiving desired values for the selected aspects of the operation of the system modeled by said system predictive model and said predicted outputs from said system predictive model and optimizing the inputs to the predictive model to minimize error between the predicted and desired values; and

a control input device for applying the predicted control value to the system and the optimized input values to the system after optimization thereof, wherein a change in the select one of the unmeasurable outputs is not accounted for in the control input device.

2. (Previously Presented) The controller of Claim 1, wherein said optimizer is further operable to receive constraints on said input values such that the optimization operation changes the inputs within said constraints when minimizing the error between the predicted and desired values.

3. (Previously Presented) The controller of Claim 1, wherein the system is subject to at least one disturbance variable that alters the operation of the system and wherein said predictive model will predict the behavior of the selected aspects modeled thereby in response to changes in the at least one disturbance variable and said optimizer will change the inputs to again minimize the error between the predicted and desired values.

4. (Previously Presented) A method for controlling a multi-variable input system having a plurality of manipulatible variables (MVs) as inputs, and operable to provide a plurality of measurable outputs and at least one unmeasurable output, which unmeasurable output can not be measured in substantially real time and requires external analysis for the determination of parameters thereof, comprising the steps of:

providing a system predictive model that provides a model of the dynamics of selected aspects of the operation of the system for modeling the dynamics thereof and providing at least one predicted output for at least a select one of the measurable outputs;

providing an external predictive model for predicting as a predicted control value the dynamic response of a select one of the measurable outputs as a function of the at least one unmeasurable output parameter and the desired value for that at least one parameter to predict the dynamics as a desired value of the select one of the measurable outputs required to achieve a desired value of the at least one unmeasurable output;

receiving in an optimizer desired values for the selected aspects of the operation of the system modeled by the predictive model and the predicted outputs from the predictive model in addition to the desired value of the select one of the measurable outputs generated by the external predictive model and optimizing the inputs to the predictive model to minimize error between the predicted and desired values; and

applying the predicted control value to the system and the optimized input values to the system after optimization thereof, wherein a change in the select one of the unmeasurable outputs is not accounted for in the control input device.

5. (Currently Amended) The method of Claim [[13]]4, wherein the step of optimizing is further operable to receive constraints on the input values such that the optimization operation changes the inputs within the constraints when minimizing the error between the predicted and desired values.

6. (Currently Amended) The method of Claim [[13]]4, wherein the system is subject to at least one disturbance variable that alters the operation of the system and wherein the predictive model will predict the behavior of the selected aspects modeled thereby in response to changes in the at least one disturbance variable and the step of optimizing will change the inputs to again minimize the error between the predicted and desired values.

7. (Previously Presented) The controller of Claim 1, wherein said external predictive model comprises a linear model.

8. (Previously Presented) The controller of Claim 1, wherein the unmeasurable output comprises a product that is fabricated by the system.

9. (Previously Presented) The controller of Claim 1, wherein said optimizer is not operable to utilize said external predictive model during the operation thereof for the purpose of prediction therewith.

10. (Currently Amended) The method of Claim [[13]]4, wherein the external predictive model comprises a linear model.

11. (Currently Amended) The method of Claim [[13]]4, wherein the unmeasurable output comprises a product that is fabricated by the system.

12. (Currently Amended) The method of Claim [[13]]4, wherein the step of optimizing is not operable to utilize the external predictive model during the operation thereof for the purpose of prediction therewith.